

PCT

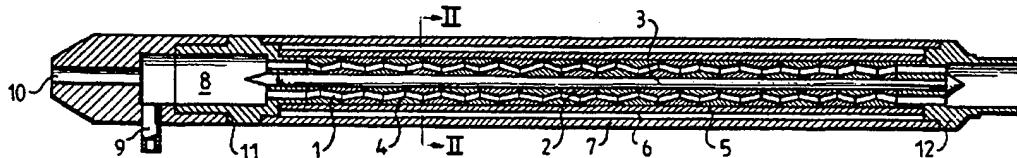
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : B05B 5/047, 7/14		A1	(11) International Publication Number: WO 94/27730 (43) International Publication Date: 8 December 1994 (08.12.94)
(21) International Application Number: PCT/SE93/00781		(81) Designated States: CA, CZ, DE (Utility model), FI, JP, LV, NO, PL, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 29 September 1993 (29.09.93)		Published <i>With international search report. In English translation (filed in Swedish).</i>	
(30) Priority Data: 9301795-2 25 May 1993 (25.05.93) SE			
(71) Applicant (for all designated States except US): TRINCO AB [SE/SE]; Karlavägen 21, S-567 21 Vaggeryd (SE).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): PEHRSON, Mikael [SE/SE]; Bokvägen 6, S-360 30 Lammhult (SE). PETTERSON, Jan-Olof [SE/SE]; Björkängsvägen 19, S-562 50 Månsarp (SE).			
(74) Agent: AHLPATENT AB; Förborgsgatan 27, S-554 39 Jönköping (SE).			

(54) Title: DEVICE FOR USE BY ELECTROSTATIC POWDER COATING



(57) Abstract

The present invention is for a device for use by electrostatic powder coating. The device is intended for charging and application of powder. The device according to the invention has smaller outer dimensions than prior art devices due to a specially designed charging channel. This also makes it possible to obtain a large flow of powder and a smooth coating. The device is less subject to wear and maintenance and repair, e.g. exchange of worn parts is simple. The essential part of the invention is the mixing channel. In the embodiment shown in the figure the channel is formed by several small building elements, inner elements (2) shown in figure 4 and outer elements (4), as shown in figure 3. The building elements are held together by a central rod (3) and a surrounding outer tube (5). This in turn is surrounded by a slit (6) and an outer casing (7) shaped as an outer tube. The inlet (11) and the die (12) are also attached to the tubes (5 and 7).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LJ	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

DEVICE FOR USE BY ELECTROSTATIC POWDER COATING

The present invention is for a device for use by electrostatic powder coating. The device is intended for charging and application of powder and is made as a powder spray gun which can be a separate manually operated unit or be a part of a plant and e.g. be controlled and handled by an industrial robot.

By electrostatic powder coating a flow of electrostatic charged powder particles are sprayed onto the surface which is to be coated. The surface is often a flat sheet, usually made from metal and a typical application is outside walls for refrigerators, dish washers and other household machines. Conveyance of powder through the device which is required for charging and application of the powder is by means of a gas flow, preferably pressurized air.

Several different designs of powder spray guns are known in the prior art. Swedish patent No. 8504893-2 describes a device where charging takes place in several spirally shaped charging channels having a common outlet through a die. U.S. patent No. 4,417,696 describes a device where the charging takes place in a tubular channel and in an adjacent die. The channel is made from several surrounding segments which have a charging layer on the inside delimiting a straight smooth channel. The layer and the ring elements are designed to allow leak currents.

The known devices have certain deficiencies regarding manufacture and use thereof. They are relatively large and thus take up much space and they are clumsy in handling, especially by manual work. Also their capacity is comparatively low if measured as flow of powder per time unit and the layers of powder which are obtained may have unsatisfactory smoothness, e.g. the coating may be thicker along the edges of the surfaces. The known devices are also such that the wear from the powder flowing through the device is very heavy and repair

and maintenance due to wear is complicated and costly.

The present invention is for a device for charging and application of powder by electrostatic powder coating so that the abovementioned disadvantages are avoided. The device according to the invention has smaller outer dimensions than prior art devices due to a specially designed charging channel. This also makes it possible to obtain a large flow of powder and a smooth coating. The device is subject to less wear and maintenance and repair, e.g. exchange of worn parts is simple.

The invention will be described below with reference to the annexed figures.

Figure 1 shows a cross section through the main part of a device according to the invention with a channel for charging of powder and inlet and outlet devices.

Figure 2 shows a cross section of the device of figure 1.

Figures 3 and 4 show a cross section of those elements from which the channel is built.

Figure 5 shows in the direction of the powder flow a restriction washer for use in the device in the invention.

The device shown in figure 1 has a channel 1, through which the powder is conveyed and charged. This channel has a zig-zag-shape seen in the cross section along the flow of the powder. The device is held together by a central rod 3 and surrounding casing 5 and 7. Furthermore, the invention comprises a die or outlet 12 and an inlet 11. The inlet has connections 9 and 10 for powder and pressurized air and an inlet distribution plenum 8.

The essential part of the invention is the mixing channel. In the embodiment shown in the figure the channel is formed by

several small building elements, inner elements 2 shown in figure 4 and outer elements 4, as shown in figure 3. Preferably these are made from PTFE, but also other material may be used. The elements are held together by a central rod 3 and the surrounding outer tube 5. This in turn is surrounded by a slit 6 and outer casing 7 shaped as an outer tube. The inlet 11 and the die 12 are also attached to the tubes 5 and 7. The exact shape of the building elements and their number can be varied somewhat due to the intended application. A mixing channel according to the figure 1 is obtained from fourteen outer and inner elements and in each end of the channel an end element of half length. In this way a mixing channel of a total length of about 375 mm is obtained. The outer diameter of the outer elements is less than 30 mm and the device thus has small total outer dimensions. The free opening in the mixing channel in the preferred embodiment as shown in the figure is about 4 mm. The capacity of the device is about 400 grams of powder per hour when used with pressurized air of 2 bar.

One or more restriction washers of the kind shown in figure 5 may be inserted into the mixing channel. It is convenient to make use of at least one washer which then is placed in the mixing channel at a distance from the inlet which is about 2/3 total length of the channel. Application of the restriction washers cause a finer invariable flow and the risk for pulsating flow which otherwise exists is avoided. Depending upon the actual application one or more restriction washers may be mounted in various positions. In the inlet 11 and the die 12 there are channels with a corresponding cross section through which the powder is delivered to and from the charging channel.

A device according to the invention can within the general idea thereof be made in different embodiments and is not limited to the embodiment described above. It has already been mentioned that the exact design, the number and the material of the elements from which the channel is made may vary. Also the exact shape, number and position of the restriction washers may

vary. There may also be other supplies of air for distribution and control of the powder within or outside the channel, one purpose thereof being to prevent clogging of the channel.

CLAIMS

- 1) Device for charging and application of powder by electrostatic powder coating comprising a channel (1), through which the powder is transported by means of a gas flow, characterized therein, that the cross section of the channel in the direction of the powder flow is zig-zag-shaped.
- 2) Device according to claim 1, characterized therein, that the channel (1) is formed as a slit between several inner (2) and outer (4) elements.
- 3) Device according to claim 2, characterized therein, that the elements (2, 4) are made from PTFE.
- 4) Device according to any of the preceding claims, characterized therein, that at least one restriction washer (13) is positioned in the channel (1).

Fig. 1

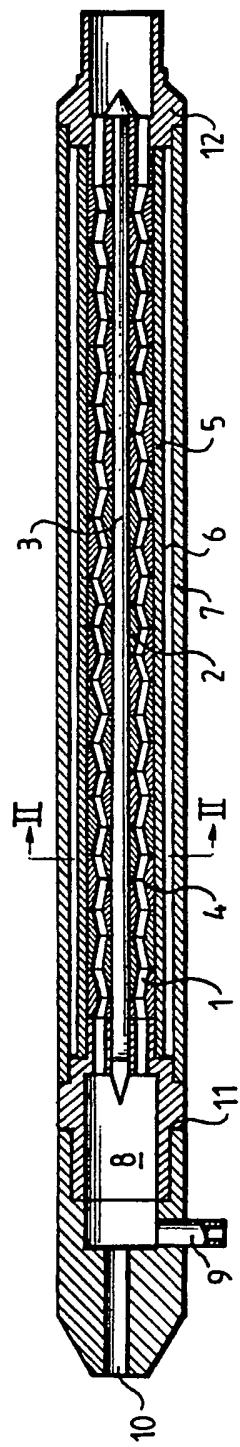


Fig. 2

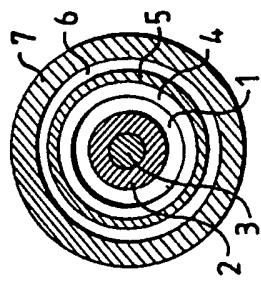


Fig. 3

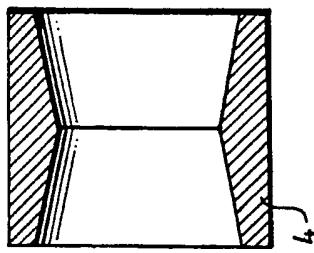


Fig. 4

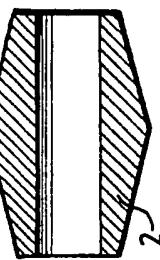
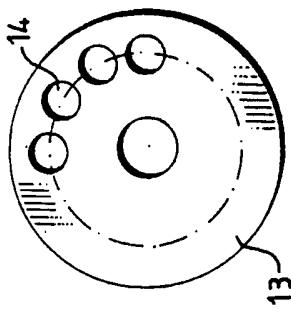


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00781

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5: B05B 5/047, B05B 7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5: B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4135667 (GYÖRGY BENEDEK ET AL), 23 January 1979 (23.01.79), figure 2, claim 1, abstract ---	4
X	WO, A1, 9211949 (JASON INDUSTRIES LIMITED), 23 July 1992 (23.07.92), page 4, line 9 - page 5, line 6, figure 2b, abstract	1-3
Y	page 4, line 9 - page 5, line 6, figure 2b, abstract -----	4

 Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

30 -08- 1994

16 August 1994

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Johan von Döbeln
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/07/94

International application No.

PCT/SE 93/00781

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4135667	23/01/79	NONE	
WO-A1- 9211949	23/07/92	WO-A- 9211950	23/07/92